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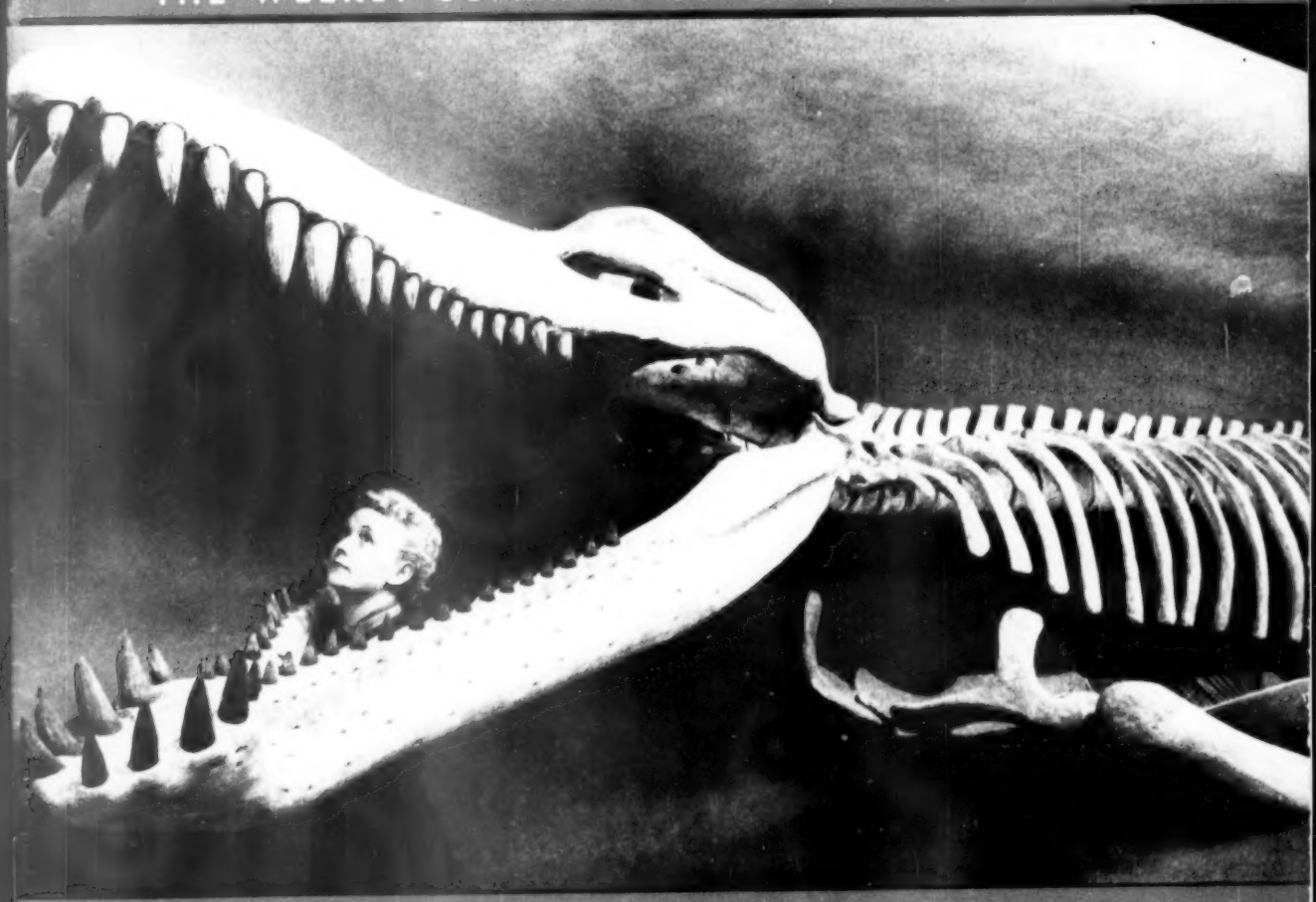

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METEOROLOGY

High Atmosphere Warms

A complex chain reaction, initiated by the southward movement of very cold air, has been identified as the cause of the "explosive" warming of the stratosphere.

➤ AN "EXPLOSIVE" warming of the high atmosphere has been discovered through study of weather information radioed earthward from high-flying balloons.

No direct connection between this high-level warming and ground weather has been established, but weathermen suspect there is one. When such a connection is established, more accurate predictions of long-range weather can be made.

Sidney Teweles of the Weather Bureau's office of meteorological research and his associates have been studying the known examples of sudden warming in the usually inert stratosphere. One occurred on Jan. 24 of this year and, by coincidence only, on Jan. 24, 1957. The latter warming amounted to as much as 31 degrees Fahrenheit in only 12 hours.

In the Arctic, a total warming of 115 degrees, from 114 below to one degree above zero, was observed in less than two weeks in 1957, beginning Jan. 24.

Several other instances of rapid warming of the upper stratosphere have been reported in recent years, but none was as thoroughly recorded as the 1957 one. Although radiation from the sun was at first believed to be the cause, most weathermen now agree the causes are earth-bound and in some ways like those responsible for our daily weather changes.

The explanation for the explosive warming in 1957 given by Mr. Teweles is based on recent work by his chief, Dr. Harry Wexler, and others. It involves a complex chain reaction, set off by southward movement of extremely cold air, produced near the North Pole during the long darkness of the Arctic night.

During autumn months, the increasing weight of the steadily cooling air mass was balanced by the centrifugal force generated by a surrounding belt of winds that slowly strengthened to jet stream intensity.

When the temperature difference across this Arctic stratospheric jet stream reached a critical value, the planetary flow pattern became unstable. Then the crests and troughs in the invisible air stream expanded rapidly into two loops reaching far south of the Arctic circle, one over North America and the other over Siberia. In the loops, the strong current did not have the balance it possessed at higher latitudes.

Areas of sinking and rising motion appeared within the current to produce strong temperature changes because, in the atmosphere, descending air results in heating by compression and rising air results in cooling by expansion.

The observed warming can be explained by these vertical motions, Mr. Teweles' study showed. Within a day and a half, air of the upper stratosphere made a sloping descent of 15,000 feet while moving through the southern portion of the loop along a 4,000-mile path leading into the center of warmest air.

The exceptional intensity of warming of the air current in the Newfoundland area resulted from the excessive centrifugal force associated with the great speed of the current. Layer by layer, this stratospheric jet stream shifted southward. To fill the gap on the stream's northern side, air from higher layers sank and was heated.

Science News Letter, June 14, 1958

TECHNOLOGY

Printer Types Faster Than Woman Can Talk

➤ AN AUTOMATIC PRINTER that can type out a full newspaper page in eight minutes has been developed.

It punches coded holes in ⅞-inch paper tape, as it types at the rate of 750 words per minute. This is ten times the speed of standard teletype equipment, and is five times faster than normal conversation.

Operating on the principle of the old-time stock ticker, the device has no ordinary typing keys. A wheel rimmed with letters spins at 3,750 revolutions per minute, hesitating momentarily when the proper letter comes into position. At this precise instant, a small hammer slaps the paper against the wheel.

The new machine, as yet unnamed, is the first in a family of high-speed teletypewriter units for use in combat, and was exhibited at the Armed Forces Communications and Electronics Association meeting in Washington.

Mounted on a jeep or truck as part of a combat communications center, the printer can relay high-priority messages to widely dispersed points. The tape, spewing from the machine at seven and a half inches per second, can be fed into automatic transmission equipment that, by means of the tape's punched coded holes, will relay messages exactly as received.

Not only is such relay five times faster than voice communication, but considerably more accurate, leaving a permanent printed record of the transmission for future reference.

The printer-puncher is designed to operate in conjunction with a mobile combat computer still under development, feeding the computer battle information for evaluation faster than humanly possible.

An average secretary can type at the rate of 60 words per minute; the world's record stands at 149 words per minute for a full hour of continuous typing; the machine prints and punches at 750 words per minute.

The high-speed mechanical typist was developed by Kleinschmidt Laboratories, Inc., a subsidiary of Smith-Corona, for the U. S. Army Signal Corps.

Science News Letter, June 14, 1958

COMBAT TYPER—A soldier inspects a message from the super-speed teletypewriter device developed for the U. S. Army Signal Research and Development Laboratory, Fort Monmouth, N. J. Mounted on a radio-equipped jeep, the device is tested as part of a unified mobile communications center.

ASTRONOMY

Top Star Rank: Groups Of Galaxy Clusters

➤ A TOP RANK in the hierarchy of stars is suggested by Dr. George C. Abell, assistant astronomy professor at the University of California at Los Angeles.

At the bottom rung of the hierarchy are the stars, of which the sun is one among countless billions. The stars combine into galaxies, of which our Milky Way galaxy is a fairly typical example. These, in turn, form into clusters of galaxies.

Until recently the clusters of galaxies were considered the largest astronomical unit, Dr. Abell said. He made his observations during the National Geographic Society-Palomar Observatory Sky Survey, using the powerful 48-inch Schmidt telescope at the Mt. Palomar Observatory.

Dr. Abell observed that the galaxy clusters themselves tend to combine into groups, known scientifically as second-order clusters and averaging some hundred million light years across and billions of light years away. A light year is the distance covered in one year by light, travelling at 186,000 miles per second.

Other astronomers question the existence of the groups of galaxy clusters. More detailed counts of galaxies and their distribution in space are now underway to settle the question.

Science News Letter, June 14, 1958

SURGERY

Much Surgery Needless

➤ A CONSIDERABLE AMOUNT of needless surgery is being performed on gastric ulcer cases because of the fear of malignancy, a group of West Coast doctors has found.

The fear of malignancy in gastric ulcer cases that do not seem to respond to therapy immediately, plus the inability of radiologists to differentiate between benign and malignant ulcers, has resulted in the needless removal of stomachs.

Many of these patients, had they been given a strict therapeutic routine, could have avoided surgery, said the doctors, all from the Veterans Administration Center, University of Southern California.

A nine-year study of serious gastric ulcers, those that previously would not heal or were found to recur, has led the doctors to favor their therapeutic treatment instead of immediate surgery.

The management of gastric ulcers by the California investigators included thorough diagnostic measures. This meant X-ray determination of the type of ulcer, if possible. This was followed by an internal examination of the stomach and diagnosis of cells shed from the diseased area of the stomach. Biopsy, gastric analysis, complete diagnostic work-up and strict therapeutic routine followed.

Of more than 200 cases of benign-appearing gastric ulcers, which might have been surgically removed for suspected malignancy, 50% responded to the strict routine therapy and healed within a six-week period, the doctors told a group attending the World Congress of Gastroenterology in Washington.

Therapeutic measures included complete bed rest, regular doses of antacids, special diet, sedatives and a preparation that inhibits mouth secretions.

If this regimen of care were followed, it would remove from the minds of physicians and patients the fear of malignancy as the prime reason for surgery, one of the doctors said. Therefore, a much smaller number of patients would undergo surgery.

In conclusion, the doctors stressed the following:

1. Surgery is not indicated for all gastric ulcers.

2. Fear of malignancy is not a reasonable indication for operating on benign-appearing ulcers.

3. The average death rate throughout the country for surgery when malignancy is suspected exceeds the risk of this recommended therapeutic treatment.

Science News Letter, June 14, 1958

ANTHROPOLOGY

Bird Cry Sets Calendar

➤ SOME of the native calendars of mountainous northern Luzon in the Philippines are regulated by neither the sun nor the moon, but by certain recurring events of nature.

To this day, the hard-working farmers of Bontoc are able to inspire the envy of their neighbors by stuffing their granaries full of rice procured through setting their calendars to the cry of a baby bird, Dr. William Henry Scott, Farmingdale anthropologist, reports in the *American Anthropologist* (June).

One should start to sow, these people believe, when the baby kiling bird can only chirp "ki-ik." When it has developed its full-throated "kiling," transplanting should begin. On this bird-directed schedule, the rice will flourish when the mountain streams are swollen and be ready for harvest before the water courses dry up again.

The Igorots do not count the passage of time at all, or at least nothing in their native language indicates they do. They do not reckon their own ages or know how many years ago a specific thing happened.

They do not even use ordinal numbers to indicate the order in which events took place. Parents speak of an eldest or youngest child but not of a third or a fourth, and there are parents who do not even recall which of their children was born first.

In the Mountain Province, the year is divided into 12 seasons, but a month is not considered as a certain number of days. It is a new or full moon that occurs during a certain season. Do-ok is the name of a month in Besao, but in Sagada it is simply the time of the year when food is scarce, water low and dysentery rife.

Sagada is a village about 3,000 feet higher than Bontoc. The people there cannot depend on the migration of birds for their calendar since they must plant a month or so before the birds come.

They watch the sun's distance from the celestial equator and start sowing when the sun rises in line with two certain rocks projecting from the tops of the adjoining hills.

In surrounding villages lower than Sagada, they do not bother to listen for the birds or watch the sun, they just keep an eye on when the Sagada people plant.

Science News Letter, June 14, 1958

MEDICINE

Improve Gout Treatment By Switch to Intravenous

➤ A SWITCH in the method of administering an anti-gout drug has eliminated one of the big headaches facing many gout patients.

Colchicine, a well-known fighter of gouty arthritis, has long been known to relieve the severe pain accompanying this disease. Many patients, however, after taking colchicine orally, experience gastrointestinal upset and pain almost as severe as the gout symptoms themselves.

Patients who suffered gastrointestinal pain when given oral doses of the drug were switched to intravenous administration with an intravenous preparation of colchicine.

The results showed that the switch produced relief of the acute gouty attack more promptly and considerably reduced the gastrointestinal upset, Drs. J. E. Seegmiller, K. Lemone Yielding and Leonard Laster, Arthritis and Rheumatism Branch of the National Institute of Arthritis and Metabolic Diseases, Bethesda, Md., have reported.

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PALEONTOLOGY

Ancient Fossil Exhibited

See Front Cover

➤ THE ONLY complete 100-million-year-old fossil skeleton of what was once the largest flesh-eating reptile in the sea has been reconstructed at Harvard's Museum of Comparative Zoology, Cambridge.

The 42-foot-long skeleton of Kronosaurus, which, next to the whale, is the largest marine animal ever known to exist, is housed in a separate room.

During the Lower Cretaceous period of the earth's history, *Kronosaurus queenslandicus,* a species of Plesiosaur, roamed the sea that formerly covered a portion of present Australia. When the water receded, years later, the sea bottom became part of the continent of Australia. Parts of the skeleton of Kronosaurus began to show through the limestone in which it had become imbedded.

William E. Schevill, research associate at the museum, discovered the partially exposed fossil remains in 1931. After dynamiting loose the rock blocks containing bones, the blocks were shipped to Harvard. Arnold Lewis, preparator at the museum, spent laborious years removing the soft but resilient skeleton from its rocky prison.

Once freed from the rock, the bones were immersed in acetic acid to remove small rock fragments and clean the surface. Gaps in the fossil skeleton left by missing bones and eroded bone parts have been filled in, using glue, asbestos fiber and plaster of Paris. A welded steel framework supports the massive reconstruction.

The photograph on the cover of this week's SCIENCE NEWS LETTER shows Miss Nelda Wright, a research assistant and editor of publications at the Museum of Comparative Zoology, as she places her head in between the bony jaws of Kronosaurus.

Plesiosaurs had broad, flat bodies, with four oar-shaped limbs with which they paddled through the water in search of fish and other animal food. Besides a long tail, most Plesiosaurs had a long, flexible neck supporting a comparatively tiny head.

Kronosaurus, however, had a short neck, only 10 feet. It sported a nine-foot long, triangular shaped skull which contained 80 spiky teeth, some as long as eight inches. Harvard's skeleton has a 20-foot long and six-foot wide body, with a 10-foot tail.

Other species of Plesiosaur have been found in the United States, in Kansas, New Jersey and Wyoming, and in England and Germany.

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HORTICULTURE

Chemical Shortens Mums For Use as Potted Plants

➤ TALL-GROWING chrysanthemums may soon be cut down to size—pot size—through the use of a chemical growth retardant.

U. S. Department of Agriculture scientists predicted that Amo-1618 will make possible mums with shortened stems but normal sized blossoms and leaves. Using the new compound, Dr. Henry M. Cathey, horticulturist at USDA's Agricultural Research Service, Beltsville, Md., has already successfully grown attractive plants of various suitable heights.

Now, dwarf varieties only are grown for pot plants. With applications of Amo-1618, either in sprays, mixed with dry soil or added to soil in solution, or by soaking cuttings in a solution, home gardeners should be able to grow other varieties in pots.

Treated plants, USDA scientists found, bloom later than normal mums and have leaves that are a darker green.

Amo-1618 is not available now commercially. When it is, however, pinching and staking chrysanthemums to get more attractive plants may become a thing of the past.

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POTTED MUMS—Four Yellow Lace chrysanthemums show the effects of treatments with the growth retardant Amo-1618. The plant at the left was untreated, while the other three received increasingly larger amounts of the chemical. This photograph was taken after all the treated plants had come into flower and just before the untreated plant shed its bloom.

RADIOLOGY

Photograph Heart In Three Dimensions

➤ THREE-DIMENSION motion pictures of the activity of the heart are now possible, Stanford Medical School radiologists report.

Newly acquired equipment makes it possible to study cardiac motion and blood flow through the heart, lungs and great vessels in two planes simultaneously, Prof. Herbert L. Abrams, Stanford radiologist in charge of the research, said.

Conventional single-plane equipment gives only the height and width of a heart chamber. To study the chamber's motion and blood volume, its depth, or third dimension, is also needed. The new equipment is able to do this, to "stop" movement down to a thousandth of a second to get sharper views of pumping heart chambers and blood jets.

The equipment, which cost approximately $100,000, employs two 11-inch "image intensifiers" at right angles to each other. One is sunk vertically into the floor beneath the patient, the other is mounted horizontally on rollers at his side.

This intensifiers form the X-ray picture on their circular 11-inch screens, much as an ordinary fluoroscope does. The intensifiers brighten the fluoroscopic image 100 times. This results in lowered amounts of X-rays needed.

Studies are usually performed with a catheter, or plastic tube, inserted into the heart through a vein. An opaque substance is rapidly and automatically injected through the catheter into a heart chamber.

Meanwhile, X-ray tubes, suspended from the ceiling, beam their rays at right angles through the patient directly into the image intensifiers. The two images produced are caught on specially processed 35 millimeter motion picture film, and record the movement of the opaque material through the heart, lungs and great vessels.

The end product is two separate film strips showing the same motion from different angles. The two films can be studied or projected together to give dimensions of the cardiac chambers in two planes simultaneously.

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PHYSIOLOGY

Care for "Runaway Heart"

Doctors have found that they can slow down the heart's wild racing spells, which damage heart muscle, by increasing blood pressure.

➤ "RUNAWAY HEART," a condition known as arrhythmias where there are wild racing spells and other abnormal rhythms, may lead to serious heart damage if not properly treated.

This was reported by a team of Los Angeles cardiologists before the American College of Physicians meeting in Los Angeles. The team consists of Drs. Elliot Corday and Herbert Gold of the University of California at Los Angeles Medical School, John Williams, Cedars of Lebanon Hospital, and Lauro de Vera, now of the University of the Philippines.

The group described results of animal studies, using a new flowmeter developed by Cedars of Lebanon scientists and UCLA physicists, in which effects of abnormal heart rhythms on blood flow within the heart were measured.

The Los Angeles doctors said runaway heart, technically called ventricular tachycardia, decreased blood circulation within the heart by as much as 65%; irregular twitching heart (auricular fibrillation) by as much as 44%; and flutters and skipped beats by more than 20%.

It had previously been thought that arrhythmias did not affect the coronary blood flow, and these attacks had often been disregarded.

Arrhythmias should be considered a medical emergency, particularly in the case of the racing heart where blood flow is sharply reduced, and be treated accordingly. The doctors pointed out that heart nourishment is depleted during the racing spells and the heart thus may become severely damaged, especially if coronary arteries were previously narrowed by aging or other factors.

A new method of slowing the racing heart consists of raising the blood pressure with drugs. Arrhythmias causes a drop in blood pressure which drastically lowers the heart's blood supply. If blood pressure is raised, the racing spell can be broken within a few seconds, the doctors have found.

The drug they use for this purpose is a relatively new one, noradrenalin. It works instantly, whereas older heart regulatory drugs such as digitalis and quinidine require up to three hours to take effect. In that time, permanent damage to the heart often occurs.

The investigators said they had also found the answer to a baffling problem posed by ventricular tachycardia. Sometimes this runaway heart takes a mild form which does not disturb the patient too much. There are times, however, when it takes a critical form that brings on shock, collapse and death in a few hours.

The critical form, it was found, originates in the upper rim of the heart. It then generates waves which severely interfere with heart muscle action by pushing blood in an opposite direction to the normal course.

Mild tachycardia starts in the heart's lower tip. It then produces waves which correspond to the normal upward pumping action of the muscle and thus interferes little with the blood flow. What causes the condition to originate either at the lower or upper part of the heart remains a mystery.

The Los Angeles doctors said that prompt treatment of arrhythmias, particularly the runaway heart variety, would reduce the mortality rate from coronary heart disease considerably.

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NATURAL RESOURCES

Western Water Excellent, Prediction for 1958

➤ SNOW-WEARY western farmers can look forward to a bumper crop this year as water supplies for almost all irrigated areas of western states are expected to be good to excellent in 1958.

This is the prediction of Homer J. Stockwell, snow survey supervisor, and Norman S. Hall, snow survey leader, of the Soil Conservation Service, in *The Reclamation Era* (May), issued quarterly by the Bureau of Reclamation, Department of the Interior.

Large areas of California and the Southwest hold snowpacks approaching a maximum of record and only in a few small areas of the western mountains is the snowpack less than normal. Violent storms at the end of March and in early April contributed a record increase for such a short period.

Reviewing conditions since a year ago, the forecasters note precipitation has generally exceeded normal for the past ten months. Streamflow from 1957 snowmelt exceeded demands, encouraging substantial reservoir storage, thus adding to the current bumper water supply. Winter rainfall has left irrigated soils wet, which will further reduce the demands for early irrigation water.

The scientists warn, however, that the excellent supply should not encourage the careless use of water.

Currently, increasing long-term demands in many areas of the West exceed the supply, and every effort must be made to use available water as beneficially as if shortages were expected. Adequate use is desirable for maximum production, but waste will aggravate drainage problems and decrease soil fertility, and next year's snowpack might well be less plentiful.

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GOLDEN MAZE—A maze of gold-plated taper pin connectors is part of the Daystrom System being installed as part of the digital computer at the Sterlington Steam Electric Station near Monroe, La. All "hot" vacuum tubes are replaced by transistors. An operator checks the connectors on one of the computer's printed circuit cards. The computer will give an automatic record of operating conditions at the station without reading dials or recorders, Daystrom engineers report.

ENTOMOLOGY

Hot Frogs Entice Mosquitoes to Feed

➤ WARMED-UP frogs and toads are a boon to hungry mosquitoes. They are preferred 100% to amphibians at room temperature.

Experimenting with the cold-blooded frogs and toads, Edwin R. Willis of the pioneering research division, U. S. Army Quartermaster Research and Engineering Center, Natick, Mass., found mosquitoes were attracted to them when they were artificially warmed. Many mosquitoes even probed the warm board on which the animals were tied.

A wet, warmed-up lizard is also more attractive than a dry one, the researcher found. The lizard's heavily scaled skin prevented most of the mosquitoes from feeding.

Given a choice, however, a mosquito will take a human hand instead of a warmed-up toad.

Apparently the heat lost by an animal to the surrounding air is the stimulus to which host-seeking mosquitoes respond, Dr. Willis reports.

Details of the experiment appear in the *Annals of the Entomological Society of America* (May).

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BIOCHEMISTRY

Study Cloroplastin

The mysterious process of photosynthesis has been seen outside the living plant cell. Scientists now have visual indications of the steps that occur in the process.

➤ BASIC STEPS in photosynthesis—the mysterious process by which green plants convert sunlight, one kind of energy, to make food, another kind of energy—have been duplicated outside the living green plant.

"Chloroplastin," a complicated extract of chloroplasts containing chlorophyll and other pigments as well as proteins and fats, was used to see if photosynthetic-like reactions were possible outside the plant cell.

The photochemical activity of chloroplastin was tested, the scientists report in *Science* (May 30), by reducing a dye in the presence of light, releasing oxygen, and converting inorganic phosphate to more complicated forms.

Drs. Russell A. Eversole, now of Vitamins, Inc., Chicago, and Jerome J. Wolken of the University of Pittsburgh Medical School, report that one-fifth of their chloroplastin preparations reduced the dye 2,6-dichlorobenzenoneindophenol completely within two minutes. There was no reduction in the dark.

This gave the scientists a visual indication that steps in photosynthesis occurred. Other yellow-orange pigments, the carotenoids, are involved in this process.

Further tests with the dye-reducing extracts showed that they caused photolysis, producing oxygen, another typical photosynthetic reaction.

Inorganic phosphate was converted to organic phosphate. This indicates the extract was able, in the presence of light, to utilize simpler compounds to make more complicated compounds. Digitonin, a detergent used in experiments to make extracts, was used. Chloroplasts were isolated from *Euglena*, a one-celled plant.

Other photosynthetic reactions might have occurred if other plants had been used. A tree and a photosynthetic bacterium would react differently.

Although the scientists are not able to account for the variability in activity they found in various preparations of the extract, they have shown typical photosynthetic reactions produced by a plant extract in the test tube.

The research was conducted at the University of Pittsburgh's Eye and Ear Hospital.

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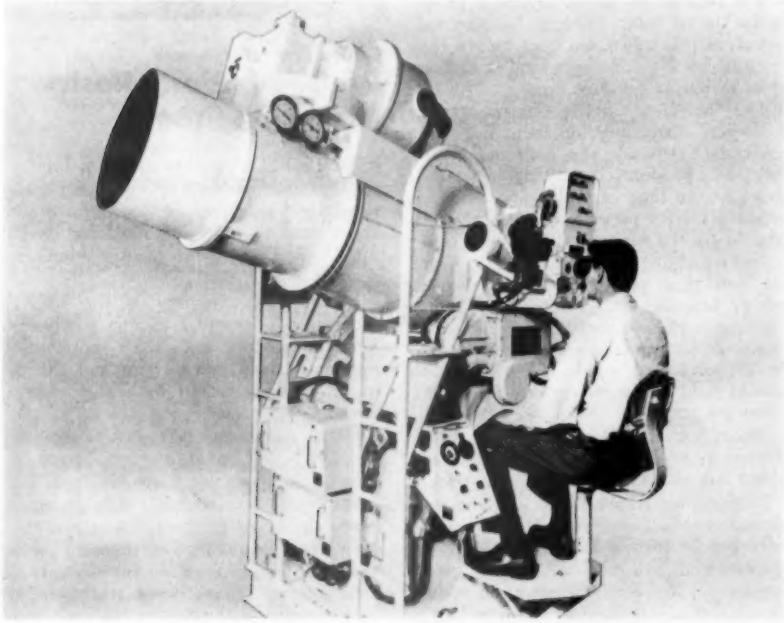

IGOR MARK II—Performance of America's ballistic missiles and satellite launchers are now being evaluated and improved with the aid of the IGOR MARK II, believed to be the nation's newest and most advanced missile tracking instrument. It records in clear, permanent form valuable data regarding attitude and condition of missiles in flight.

● RADIO

Saturday, June 21, 1958, 1:30-1:45 p.m., EDT.
"Adventures in Science" with Watson Davis, director of Science Service, over the CBS Radio network. Check your local CBS station.

Dr. J. C. Siegrist, director of veterinary research, Schering Corp., Bloomfield, N. J., will discuss "Tranquilizers for Animals."

PHYSICS

First Liquid Helium Bubble Chamber Built

➤ THE WORLD'S FIRST and so far the only known liquid helium bubble chamber has been built by physicists at Duke University, Durham, N. C.

Drs. Martin M. Block and William M. Fairbank said the new chamber was developed as a research tool to study the strange new particles found when atomic cores, or nuclei, are broken apart by high-energy bombardment.

It operates at about 453 degrees below zero Fahrenheit, only a few degrees above absolute zero, the lowest obtainable temperature.

Bubble chambers are a recent development for studying the interactions of nuclear particles. The Duke University unit differs from other bubble chambers in using liquid helium instead of liquid hydrogen or other liquids.

Similar chambers are planned by scientists at Oxford University in England, the University of Rome in Italy and at Washington University, St. Louis, Mo. One will also be built in Moscow, according to unofficial reports.

To operate the chamber, liquid helium is suddenly expanded in volume. It is then in an unstable state, ready for boiling but lacking centers around which bubbles can form. Charged particles moving in the liquid cause ionization that acts as centers for bubble growth. A particle thus leaves in its wake a string of bubbles defining its path. This trail is photographed to give a picture of the track of nuclear particles.

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PHYSIOLOGY

Specialist to Study Heart of Kangaroos

➤ HEART SPECIALIST Dr. Paul Dudley White, who attended President Eisenhower, hopes to record the heart beats of emus and kangaroos at Taronga Zoo Park, Sydney, Australia.

He has tested the heart beat of whales and elephants as part of his research into the heart beat of large mammals.

Dr. White is in Sydney to advise on the establishment of a national heart foundation in Australia.

The cardiologist, president of the International Society of Cardiology, said the Australian foundation would gather funds, for teaching, research, education and travel.

He would suggest that the foundation be supported with both government and private funds, also that it should have laymen as well as doctors on its advisory panels.

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ASTRONOMY

First Instrument Measures Star Diameter

➤ THE WORLD'S first star-measuring instrument of its kind, an intensity interferometer, is being set up by Sydney University at Narrabri, New South Wales, Australia, to measure the diameter of stars.

The device consists of two mirrors, each 20 feet in diameter, weighing about five tons. These are mounted on wheels and move along rails. Each mirror will cost about $40,000.

Movement of the mirrors in conjunction will enable scientists to work out mathematically the diameter of stars.

Manchester University, England, is cosponsoring the project. Prof. Harry Messel, head of the school of physics at Sydney University, and Dr. R. Twiss, Commonwealth Council for Scientific and Industrial Research, have chosen a site for the instrument, which will be operated by Dr. Twiss.

Dr. Twiss said diametric measurements would give scientists a much clearer idea of a star's appearance. From the measurements, they could tell whether stars were flattened through rotation and whether they were large or small bodies.

He will go to England to supervise construction of the interferometer. Building it will take 18 months and testing, six months. It is hoped the device will be operating in two and one-half years.

The first project with the interferometer will be the examination of 100 of the brightest stars in the Southern Hemisphere. This will take four to five years.

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BIOPHYSICS

Understanding of Cell Foreseen in Ten Years

➤ WITHIN TEN YEARS we may understand the living cell and its complex structure and processes, a biophysicist has predicted.

Dr. Ernest C. Pollard, chairman of Yale University's department of biophysics, said biophysics has already given us the ultimate unit of molecular structure—the molecules that make up the living cell. We must understand molecular structure, he pointed out, if we are to understand genetics and heredity.

Citing the recent virus studies of Prof. Seymour Benzer of Purdue University, Dr. Pollard said that we may have discovered the smallest unit that can mutate.

The "muton," as this unit is called, is measured by a nucleic acid grouping. The ultimate unit of molecular structure, the "recon," was found equal to one base pair of nucleic acid. The muton was approximately ten base pairs long. These units can help explain how mutations occur.

Dr. Pollard also told those attending his lecture, one of a series in Washington, D. C., sponsored by the National Science Foundation and the American Association for the Advancement of Science, about recent biophysics research at Yale.

Ionizing radiation is being used to learn more about the structure of a cell, its contents, size and shape. For example, researchers have determined the probable shape and size of two amino acids, methionine and proline. Bombarding a cell with atomic particles is a useful technique, Dr. Pollard explained, since a scientist can learn what is in a cell, how big the "thing" is and where it is located.

In another research project, tritium-labeled thymidine has been given to cells to trace where nucleic acid, or DNA, is found. Thymidine, which goes into DNA, definitely pinpointed the nucleic acid in the nucleus.

Study of the living cell and molecular biology is making great progress. If we are gentle in the way we take a cell apart, Dr. Pollard said, we can learn about the parts of the cell, which are important in themselves, and about the living cell itself.

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ENGINEERING

Foresee Electricity From Earth's Steam

➤ ELECTRICITY for Californians generated from steam rising from earth's hot rocks close to the surface is foreseen by Michael P. McIntyre of San Jose State College, San Jose, Calif.

The Thermal Power Company is drilling bores in rock to tap the subterranean steam at Big Geysers, a few miles north of Santa Rosa, Calif. The aim is to harness this natural energy for the production of electrical power.

It is believed to be the first such project in the United States, although "geothermal" power, as it is called, has been tapped both recently in New Zealand and for many years in Italian Tuscany.

The "hot land" at Big Geysers involves 3,200 acres extending for about five miles along the north side of a fault-line canyon. Release of pressure on the magma (molten rock) at the time of faulting, or slipping, accounts for the presence of hot rocks relatively near the surface.

Eight shallow wells and one deeper well are blowing an estimated 6,000 kilowatts of energy into the air. Temperatures at the 600-foot level have been determined as 600 degrees. If temperatures continue to rise in proportion to depth, 1,500-foot bores should yield the equivalent of at least 4,000 kilowatts per well.

Steam from Big Geysers areas has so far proved to be dry, an advantage since wet steam can corrode turbines more quickly.

Engineering reports show wells can be drilled as close together as 150 feet without reducing production of their neighbors. If a substantial portion of the property proves productive, Mr. McIntyre estimates at least 30 wells could be drilled, yielding 100,000 kilowatts of electricity.

If these results can be achieved, geothermal steam can compete very favorably in power production, Mr. McIntyre reported.

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IN SCIENCE

AERONAUTICS

Atmosphere's Energy Could Propel Satellite

➤ THE CHEMICAL ENERGY stored in the earth's high atmosphere might be used to propel a satellite indefinitely at an altitude of 60 miles. (See SNL, July 13, 1957, p. 20.)

A preliminary study of such a "fuelless" satellite has been reported by the National Advisory Committee for Aeronautics.

Drs. Lionel V. Baldwin and Perry L. Blackshear of the NACA's Lewis Flight Propulsion Laboratory, Cleveland, Ohio, have investigated the possibility of tapping the energy held by reactive chemicals in this part of the atmosphere using a ramjet engine that would recombine the chemicals to produce thrust.

Their calculations indicate that up to one-half the chemicals present at 328,000 feet could be recombined if the nozzle were 100 feet long with an inlet radius of 20 feet. This would give a thrust to the ramjet greater than the drag. It would also overcome the heating problem.

More definite information on the recombination rate for atomic oxygen than now available is needed, the scientists reported, before the feasibility of such a chemically powered satellite can be positively determined.

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ENTOMOLOGY

Well-Fed Plant Resists Attacking Insects

➤ WELL-FED lima beans, plants supplied with proper amounts of nitrogen, phosphorus and potassium for good growth, are better able to fight off attacking insects, the U. S. Department of Agriculture reports.

Experiments conducted at the USDA's Agricultural Research Center, Beltsville, Md., indicate that an insect's resistance to insecticides may actually represent changes in susceptibility caused by a plant's nutrition.

USDA entomologist Thomas Henneberry and Dr. N. W. Stuart, a plant physiologist, found that spider mites attacking pole lima beans were "easy to kill" with malathion when the beans received proper nutrients. However, susceptibility of mites to an insecticide decreased when nutrient levels were either above or below the plant's requirements.

Further experiments may show how insect control practices could be timed with seasonal variations in the nutrients in plants, thus getting better results with commonly used insecticides.

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CE FIELDS

MEDICINE

One-Shot Plastic Hypo Syringe Being Tested

➤ A DISPOSABLE medicine container that becomes a hypodermic syringe for use by diabetics, as well as in first aid kits, has been made by a plastics manufacturer for market testing.

A pilot sample of the throw-away plastic container and syringe, which looks like a small transparent toothpaste tube, was displayed at the Exposition of Chemical Industries, New York, by Minnesota Mining and Manufacturing Company's Jersey City Chemical Division, which produces the plastic from which the product is formed.

The container-syringe, made from a heat-resistant plastic called KEL-F, can be sterilized in boiling water, in a high pressure steam autoclave, or by radiation.

A company official said the high strength imparted to KEL-F plastic by its carbon, fluorine and chlorine molecular structure means a diabetes or heart patient can carry the pre-filled syringe in his pocket without fear of breakage or cracking that would contaminate the contents. Because the plastic is not penetrated by alcohols, essential oils and many other chemicals, the container-syringes can be filled with most medicines.

Minnesota Mining and Manufacturing will not produce the disposable syringes, but is now forming a small quantity of them for a plastics customer who will use the samples to gain opinions from physicians and pharmacists.

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BIOCHEMISTRY

Some Plants Accumulate High Radioactive Fallout

➤ EVIDENCE that certain plants pick up radioactive fallout "to an extraordinary degree" is reported in *Nature* (May 31).

The plants are those having a low mineral intake and growing on extremely acid soils. One such plant is the bog moss *Sphagnum papillosum,* Dr. Eville Gorham of the Freshwater Biological Association, Ambleside, Westmorland, England, reports.

Strontium-90, since it is taken up by the bones in the body as calcium is, is believed to be the most deadly product for humans in radioactive fallout. Dr. Gorham reported that the high concentration of strontium-90 in the bones of upland sheep may be due partly to the animals' reliance on mosses for fodder, particularly in hard times.

He analyzed samples of 71 species of plants and 11 samples of stream and lake waters in his preliminary study by drying them, then turning them into ashes at bright red heat. Radioactive levels of the ashes were then determined by counting the disintegrating particles thrown off by each sample.

The high radioactivity of plants growing on acid soils, Dr. Gorham reports, is due to the fact that radioactive fallout accounts for a greater proportion of the soluble or adsorbed chemicals available to the vegetation. The radioactivity of such plants has increased as much as 50-fold in the past ten years, he found by comparing specimens collected in 1958 with others collected prior to 1947.

Average increase for all plants was ten-fold, declining to as little as two-fold for plants grown on the best soils.

Dr. Gorham believes the radioactivity of today's vegetation is presumed due largely to fallout from nuclear explosions. He found no increase associated with the Windscale accident, which spread radioactive material over 200 square miles in significant quantities following overheating of a nuclear reactor at the Windscale plutonium works.

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ROCKETS AND MISSILES

Nation Short-Changed On Air Defense Dollars

➤ AMERICAN TAXPAYERS continue to get less and less defense per dollar, even at a time when Secretary of Defense Neil McElroy has set as a major Pentagon goal "a hundred cents worth of fighting power for every dollar we lay out."

That frank admission was made by the head of the Navy's Bureau of Aeronautics Purchasing Branch during the first national Missile Industry Conference, Washington, D. C.

Cmdr. Edward E. Sack said "more defense per dollar" can be accomplished only by severe cost-cutting by contractors and by an effort to cut out mechanical frills and technical refinements that are not absolutely needed in defense equipment.

"Constantly and unending rising costs which give us less defense per dollar will continue to do so until the trend is made to start down," Cmdr. Sack said.

He emphasized that the downward price trend must be "forced," because it will not go down of its own accord.

As a result of rising costs, the Navy had to cut its number of expected aircraft models in half at the middle of fiscal year 1958.

In the guided missile field, the number of missiles actually purchased was reduced 9% to 46%, depending on the model.

"The sad fact of life from where we sit," the Navy purchasing officer said, "is that few firms feel a great need to make deep slashes in their costs."

He stressed that defense costs must be cut by:

1. A concerted, purposeful and continuing effort on the contractors' part to pare costs to the bone; and

2. A constant effort on the part of the technical services to eliminate frills and unnecessary mechanical refinements, sticking only to the basic elements necessary for a piece of equipment to do a satisfactory job.

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PUBLIC HEALTH

Venezuela Expects No Malaria by 1960

➤ AN ANTI-MALARIA war that has been waging for over 20 years is now nearly over.

In Venezuela, the final pockets of resistance have been discovered and mopping up operations have begun. Complete extermination of the mosquito responsible for the disease has been predicted by 1960.

Most of the country is already free from malaria, due to the efforts of the men of the Institute of Malariologia in Maracay. In 1935 they launched an extensive program to treat the sufferers of this tropical malady.

Swamps were drained, health practices were improved and anti-malaria drugs were administered. Despite all of these weapons, by 1945, there were still more cases each year than could be treated.

That same year, a new wonder weapon was released by the armed forces, DDT. Armed with this new insecticide, Dr. Arnoldo Gabaldon, a Venezuelan, and his associates sprayed more than 500,000 homes.

Results of the program show the effect of this new weapon.

The population of Venezuela swelled to over 6,000,000. Only nine malaria deaths were reported last year. Only 899 cases of malaria were discovered. This is less for the whole country than were found in single towns in 1935.

The last evidence of malarial resistance includes carriers who enter the country and spread the disease, and children under ten years of age.

It is the hope of Venezuelan scientists that by 1960 the last case of malaria originating from within the country will have passed into the record books.

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GEOPHYSICS

Satellite's Radio Signals Show Its Future Orbit

➤ THE FUTURE ORBIT of an earth satellite can be predicted quite accurately from the change in frequency of its radio signals as received at a single station during a single pass of the object.

Drs. William H. Guier and George C. Weiffenbach of the Applied Physics Laboratory, Johns Hopkins University, Silver Spring, Md., found their Doppler system worked for both Russian and U. S. satellites, which broadcast on different frequencies.

The radio-signal method of predicting satellite orbits would be much more accurate if observations from successive passes at two or more widely separated receiving stations were combined, they report in *Nature* (May 31).

The system is based on the fact that the frequency of the radio signal broadcast by a satellite changes as the satellite passes by the earth, being higher when it is approaching the receiver, and lower when receding from it. This effect is known as the Doppler shift.

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AERONAUTICS

Coast-To-Coast in Two Hours

Commercial aircraft will fly at three and four times the speed of sound by 1966. The problems preventing the design of airplanes to fly this fast have been overcome.

By A. L. BAUN

➤ IN LESS THAN eight years, by 1966 at the latest, the air traveler will fly commercially from Los Angeles to New York in under two hours. This means that he will fly at twice the speed attained by the U. S. Air Force Major Adrian Drew, official world speed record holder, who in a F-101A Voodoo jet flashed over the Mojave desert at 1,207 miles per hour.

Startling as this prediction may appear, a commercial aircraft application of speeds between Mach 3 and 4 by 1966 is achievable. Mach 3 and 4 is three and four times the speed of sound, which is 761 miles per hour at sea level.

At last, the aerodynamic and thermodynamic problems which have stymied structural designers striving to design an air frame capable of flight at speeds above Mach 3 have been solved. One obstacle remains to be solved: the propulsion engineer has yet to devise a means for accomplishing runway ignition of the pure ramjet engine.

Turbojet and Ramjet

Universal among propulsion engineers is the belief that because of present turbine-blade metals limitations, a substantial increase in turbojet thrust can only be accomplished by increasing the size of the engine. And increased size means decreased efficiency. A practical way to increase thrust of the turbojet would be to increase heat release rates (thrust is dependent upon heat release) by burning greater quantities of fuel without increasing the size of the engine.

But here the propulsion and metallurgical engineers are blocked, for if they increase the heat release rates of our present turbojets, turbine blade distortion becomes excessive. Eventually the metals limitation problem will be solved by some yet unknown metallurgical alchemist, but it is unlikely that this rare-metals Merlin will arrive for a good many years.

The aircraft that will fly commercially from Los Angeles to New York in less than two hours by 1966 will not be powered by turbojets. They will be powered by pure ramjets burning high-energy chemical fuels.

Simplicity in itself, the pure ramjet to the propulsion engineer is nothing more than a stovepipe through which a flow of fuel and air is directed and ignited. As a propulsion device, the potential of the ramjet far outstrips the conventional turbojet both in effectiveness and reliability. Its speed is limited only by the quantity of fuel that can be forced through the injector nozzles and by the air driven past the intake spike. The ramjet has no moving compressor or turbine blades to swell and shatter when heat release rates become excessive.

In ramjet engine operation, air enters at the front of the engine and flows over an inlet spike where it is compressed. (Generally, the spike is made of highly polished metal and is shaped like an oversized football.) After the air is compressed, kerosene, flowing under pressure through fuel injector nozzles, is mixed into the air flow. A small fraction of this mixture is routed past a "flame holder" where it is ignited by glowing gases in a protected mixing cavity.

The bulk of the mixture, ignited by the gases in the "flame holder," is burned in the engine's combustion chamber. The resulting high-speed propulsion jet is directed out the especially shaped exhaust nozzle at the engine's rear. The faster the engine moves forward, the greater the ram effect through the engine and the higher the thrust or performance of the engine. Without a large volume of air flowing into the front of the engine, no thrust is produced.

Why, then, are not pure ramjets installed on our commercial aircraft when as early as 1948 an airborne pilot turned off the jet power of his F-80 airplane and flew with the power provided by 30-inch ramjets mounted on the plane's wing tips?

Unfortunately, the pure ramjet has yet to be successfully ignited on the ground at speed zero. The ramjet must still be boosted beyond its critical ignition speed by a carrier aircraft or by some other propulsion system. However, within three years, runway ignition of the engine will undoubtedly be accomplished. Present advances toward attaining runway ignition of the ramjet engine are classified by the military.

Foreign Nations Advance

The French are well-advanced in ramjet engine development. They have flown several models of the LEDUC manned ramjet aircraft which have been air-launched from conventional aircraft and ground-launched by employing turbine power to accelerate the ramjet to the required engine operating speed.

The British have exhibited a small supersonic ramjet, the Bristol THOR, which is approximately 16 inches in diameter and produces approximately 15,000 pounds of thrust at a speed of Mach 3. Already, experimental bypass type engines have been runway ignited and flown by the military in Europe. The turbojet cuts out and the bypassed ramjet cuts in when the required ignition speed is reached.

In the United States, many successful flights of full-scale, ground-boosted and air-launched pure ramjet engines have been accomplished. These flights, in the majority, have been conducted by Lockheed Missile Systems Division of Sunnyvale, Calif., the foremost developers of test vehicles for ramjet engine flight testing.

Since 1947, Lockheed has been engaged in the development of a flying test bed for various ramjet engines capable of self-sustained flight at supersonic speeds and at extreme altitudes. Known as the X-7A,

RAMJET FLIGHT—For more than 10 years, Lockheed Aircraft Corporation scientists and engineers have tested ramjet engines in a vehicle known as the X-7A. These same ramjet engines promise to power commercial planes from Los Angeles to New York in two hours by 1966. This is an artist's conception of the X-7A in flight.

the Lockheed vehicle is air-launched, boosted to flight speed by a solid propellant rocket, and recovered without damage by means of parachutes and a ground-penetrating nose spike. These flights have provided supersonic free flight operational and performance data of great value to engine manufacturers who design and develop supersonic ramjets.

By-products of the Lockheed program have been significant contributions to high-speed parachute deployment, and transonic and supersonic aerodynamic data which are of value to air frame manufacturers and the armed forces.

Military Planes Proposed

Recently, three major American aircraft manufacturers, North American, Boeing, and Convair, presented preliminary proposals to the Air Force for a manned ramjet-powered bomber capable of operating at an altitude close to 100,000 feet, at a range of 10,000 nautical miles, and at a speed in excess of Mach 4. All three companies are experienced in the flight application of either turbojets or ramjets. North American built the NAVAHO powered by Curtiss-Wright ramjets, Boeing fabricates the BOMARC powered by Marquardt ramjets, and Convair is the producer of the B-58 HUSTLER bomber powered by General Electric turbojets.

In all likelihood, ramjet engines similar to the ones now being developed by Marquardt Aircraft Corporation of Van Nuys, Calif., and test flown with the Lockheed X-7A vehicle will power commercial aircraft by 1966.

Probably, these commercial aircraft, structurally resembling our most advanced fighter-bombers, will utilize twin engine installation slung beneath an air frame which has been plastic coated to reduce skin heating and erosion.

The air traveler in these aircraft must be willing to subject himself to impressive G-forces upon take-off if he wishes to whistle from the Pacific to the Atlantic in less than 120 minutes.

Science News Letter, June 14, 1958

PUBLIC HEALTH

Infants Should Have Polio Shots Early

➤ TINY BABIES should have their first Salk vaccine shot at the same time they receive their anti-whooping cough shot, the medical director of the National Foundation for Infantile Paralysis said.

Recent studies have shown that polio vaccine can safely be given simultaneously with other vaccines for infants. The combination offers safe, effective immunity, Dr. Thomas M. Rivers reports in the *National Foundation News* (May).

"Doctors usually start two- and three-month-old babies on DPT, a triple vaccine against diphtheria, pertussis (whooping cough) and tetanus," he said, "because whooping cough can kill the very young."

Smallpox vaccination is often delayed to save the baby discomfort. Since the Salk vaccine is a mild injection with no ill effects, there is no reason to delay polio protection, he said.

Paralytic polio in the very young, while unusual, is extremely tragic. A severe attack may cripple an infant for life. Dr. Rivers cited the case of an unvaccinated 18-week-old baby boy in Houston, Texas, who was stricken with polio last February and is now in an iron lung.

Dr. Rivers based his recommendation on two independent studies by National Foundation grantees. Safe, effective vaccination of two-month-old infants with Salk vaccine in one arm and DPT in the other arm was reported by Dr. Gordon C. Brown, professor of epidemiology at the University of Michigan.

Scientists at the Vanderbilt Well Baby Clinic in Nashville, Tenn., have also studied the effects of double vaccination.

The immunization plan advised by the American Academy of Pediatrics is as follows:

Infants of two months can be given their first DPT and Salk shots together.

During their third month, infants can be given their second DPT and Salk shots together.

At four months, the infant may receive the third DPT shot only; at six months, the smallpox vaccination. The third and last polio shot can be given when the infant is ten months old.

Science News Letter, June 14, 1958

MEDICINE

Combined Toxoid Fights Home Food Poisoning

➤ ALL FIVE of the known types of botulism food poisoning caused by improper canning techniques may soon be combated by one immunizing toxoid.

Botulism poisoning is caused by a poisonous substance, the toxin formed by a type of bacteria that grows in improperly processed foods. There are five distinct types of this poison.

The disease, although relatively rare today, does still occur in rural districts where home canning is done.

The disease is known to occur in persons who eat contaminated food, with death resulting in approximately 40% to 50% of the cases. In addition, the disease often strikes animals, sometimes in epidemic proportions.

To date, scientists have developed a toxoid which will fight off the poisoning and immunize animals. The next step will be a test of its immunizing power on humans, Dr. George G. Wright, Matteo A. Cardella and Mary Anne Fiock, of the U. S. Army Chemical Corps Laboratories, Fort Detrick, Frederick, Md., said.

Whether the toxoid will be successful in humans is not yet known. However, this is the first time a purified toxoid capable of simultaneously combating all five known types of botulism poisoning has been developed, the scientists reported to the Society of American Bacteriologists meeting in Chicago.

Science News Letter, June 14, 1958

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ADVENTURES IN SCIENCE AT THE SMITHSONIAN—E. John Long and George Weiner—*Smithsonian Institution*, 24 p., illus., paper, 25¢. A colorful glimpse of exhibits, ranging from dinosaurs to satellites, at the Institution.

ANALYSES OF SOIL FOUNDATION STUDIES—M. G. Spangler and others—*Highway Res. Bd.*, 93 p., illus., paper, $2. Papers deal with the problem of construction over soft foundation soils.

THE COLLEGE WITH A MILLION CLASSROOMS—Robert Heilbroner—*Teachers College*, 16 p., illus., paper, free upon request direct from publisher, Columbia University, New York 27, N. Y.

DIETARY PREVENTION AND TREATMENT OF HEART DISEASE—John W. Gofman, Alex V. Nichols and E. Virginia Dobbin—*Putnam*, 256 p., illus., $3.95. Two authorities on heart disease and a dietician explain and apply up-to-date knowledge of fat and cholesterol.

ELECTRONIC PUZZLES AND GAMES—Matthew Mandl—*Gernsback Library*, 128 p., illus., paper, $1.95. Practical electronics for children—from 8 to 80.

FIFTY YEARS OF NEUROSURGERY: A Personal Story—Ernest Sachs—*Vantage*, 186 p., illus., $3.50. Recollections of the early years of neurosurgery at the turn of the century.

GEORGIA BIRDS—Thomas D. Burleigh—*Univ. of Okla. Press*, 746 p., with paintings by George Miksch Sutton, $12.50. The U. S. Fish and Wildlife Service, the Georgia Ornithological Society and the Garden Club of Georgia cooperated in this work.

THE GOLDEN NUMBER: And the Scientific Aesthetics of Architecture—M. Borissavlievitch, preface by Louis Hautecoeur—*Philosophical Lib.*, 91 p., illus., $4.75. Discussing the difference between aesthetics and mathematics.

HOW TO GET INTO COLLEGE AND STAY THERE—J. Spencer Carlson and others, Eds.—*Science Res.*, 121 p., illus., paper, $1.95. Discusses preparation for, choice of and cost of college education.

HOW TO SET UP A SEMESTER OR YEAR GUIDANCE COURSE—Wendell P. Hill—*Science Res.*, 29 p., paper, 50¢. Handbook for teachers describing what an 8th or 9th grader should know before planning his entire high school program. For use with guidance notebook: "Planning My Future."

LIVING SILVER—Burns Singer—*Houghton*, 232 p., illus., with drawings by Robert Frame, $3.75. A poet and keen scientific observer of marine life reports on his experiences aboard trawlers and seiners.

THE LOW-FAT WAY TO HEALTH AND LONGER LIFE: The Complete Guide to Better Health Through Automatic Weight Control, Modern Nutritional Supplements, and Low-Fat Diet—Lester M. Morrison—*Prentice-Hall*, 212 p., $4.95.

MORE MARVELS OF INDUSTRIAL SCIENCE—Burr W. Leyson—*Dutton*, 190 p., illus., $3.50. Describes the application to industry and modern living of recent scientific research.

THE NEOLITHIC AGE IN EASTERN SIBERIA—Henry N. Michael—*Am. Philosophical Soc.*, 108 p., illus., paper, $2.50. Attempts to show the pattern of complex cultural interplay with the regions surrounding Siberia—China, Central Asia, Eastern Europe, and North America.

NEW FRONTIERS IN CHILD GUIDANCE—Aaron H Esman, Ed.—*Jewish Board of Guardians (International Univ. Press)*, 218 p., $4.00. A memorial tribute to the late Johan H. W. van Ophuijsen who established the Child Guidance Institute.

NOMA GLOSSARY OF AUTOMATION TERMS—William J. Jacquette, Charles E. Ginder and Harry L. Baker, III—*National Office Management Assn.*, 35 p., paper, $2. Good reference book on the new language of automation.

101 PUZZLES IN THOUGHT AND LOGIC—C. R. Wylie, Jr.—*Dover*, illus., paper, $1. Logical puzzles that can be solved by pure reasoning.

ORBITAL DATA AND PRELIMINARY ANALYSES OF SATELLITES 1957 ALPHA AND 1957 BETA—F. L. Whipple and others—*Govt. Printing Office*, Smithsonian, 107 p., graphs, paper, $1.

PLANNING MY FUTURE: A Workbook in Educational and Vocational Planning—Wendell P. Hill—*Science Res.*, 34 p., paper, 50¢. Coordinated counseling program for 8th or 9th graders.

PLUS ULTRA OR THE PROGRESS AND ADVANCEMENT OF KNOWLEDGE SINCE THE DAYS OF ARISTOTLE (1668)—Joseph Glanvill, introduction of the facsimile by Jackson I. Cope—*Scholars' Facsimiles & Reprints*, 155 p., $7.50. Reproduces a controversial thesis of the 17th century when tradition still set moral theology above the vain curiosity of the naturalist.

PRINCIPLES OF FIELD BIOLOGY & ECOLOGY—Allen H. Benton and William E. Werner, Jr.—*McGraw-Hill*, 339 p., illus., $6.50. A textbook for a beginning ecology and field biology course.

PRINCIPLES OF MODERN PHYSICS—A. P. French—*Wiley*, 355 p., illus., $6.75. Traces the development of the concepts and theories of modern physics for the advanced undergraduate student.

RESEARCH MANAGEMENT: A Publication of the Industrial Research Institute, Vol. I, No. 1—Charles M. Burrill, Ed.—*Interscience*, 64 p., quarterly, $7.50 annually. A new forum for the latest ideas on research management discussed from the research administrator's point of view.

17 MILLION JOBS: The Story of Industry in Action—John Perry—*Whittlesey House*, 237 p., $3.95. Surveys career opportunities.

SPACE BOOK FOR YOUNG PEOPLE—Homer E. Newell, Jr.—*Whittlesey House*, 114 p., illus., by Anna Marie Jauss, $2.95. Supplies mathematics necessary for understanding space distances and rocket speeds.

SUGGESTIONS TO AUTHORS OF THE REPORTS OF THE UNITED STATES GEOLOGICAL SURVEY—*Geological Survey (Govt. Printing Office)*, 5th ed., 255 p., $1.75. The latest in a series of valuable manuals, the first of which was printed in 1888.

Science News Letter, June 14, 1958

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ENTOMOLOGY

International Tick Meet Aimed at Disease Control

➤ AN INTERNATIONAL SET of ticks is assembling at Walter Reed Hospital.

Ticks from Egypt, the Sudan, the Belgian Congo and India have already arrived. Some may be coming from Russia, Israel and other African countries.

These insects are being gathered in order to conduct a research project directed at the control of diseases caused by blood-sucking ticks.

While they are breeding, their development and methods of reproduction are under constant study in the hope that some means of control may be found. Later, the ticks may yield clues to the nature of the diseases they transmit, so that effective vaccines can be developed.

Although infectious diseases are well under control in the United States, they run rampant in many of the countries to which our armed forces are sent, Maj. Herbert C. Barnett, chief of the department of entomology at the Walter Reed Army Institute of Research in Washington, said.

The tick is a dangerous insect, second in importance only to the mosquito as a transmitter of infectious diseases. Its bite can cause many varieties of rickettsial diseases, such as Rocky Mountain fever, and other virus diseases. Maj. Barnett's laboratory now has 13 species of ticks under study.

Scientists do not yet know the exact organisms that transmit the diseases. When the causal relationships of these diseases are worked out, it is hoped that work will get under way to develop vaccines to defeat the diseases.

One major problem the researchers face is the tick's ability to develop a strong resistance to insecticides. In addition, some species of tick are completely unaffected by any known insecticide.

Science News Letter, June 14, 1958

Tungsten-base alloys will be developed with useful strength up to a range of 3,400 degrees Fahrenheit.

ASTRONAUTICS

See Safe Space Landings

➤ HUMANS can land safely from space on Venus, earth, Mars and Jupiter, if and when the space ships are available.

That is the conclusion to be drawn from a highly mathematical study of manned entry into planetary atmospheres reported by the National Advisory Committee for Aeronautics.

Dr. Dean R. Chapman of NACA's Ames Aeronautical Laboratory, Moffett Field, Calif., has developed a solution to the general equations of motion that can be used by engineers to calculate how virtually any kind of vehicle would react when entering a planet's atmosphere. Included are skip, glide, satellite, ballistic or space vehicles.

Among the important aspects of the "challenging problems connected with space flight" are the intense heating and the possibly severe forces of deceleration for human occupants. Another is having satisfactory control over both the time and location of landing on a planet.

Although each of these related problems is difficult, none is insurmountable, Dr. Chapman's analysis showed.

His "relatively simple equations" apply to any selected planetary atmosphere and to both lifting (airplane-like) and non-lifting vehicles, whether they make a shallow or a steep descent. They also apply to a combination of the various kinds of entries, even when these are changed during descent.

For earth, Dr. Chapman finds, the region of most important heating and deceleration for a given vehicle occurs only over a roughly 70,000-foot strip across which the air's density changes by a factor of 20.

Entry into the atmosphere of Venus involves only slightly less deceleration and heating than entry into the earth's atmosphere. Entry into the Martian atmosphere involves much less deceleration and heating, and entry into Jupiter, much more.

Comparison of Dr. Chapman's solution with electronic computer results for a standard earth atmosphere shows only small differences of about ten percent. His report, "An Approximate Analytical Method for Studying Entry Into Planetary Atmospheres," is expected to become the space engineer's bible.

Science News Letter, June 14, 1958

FOOD TECHNOLOGY

Temperature and Time Affect Frozen Foods

➤ "SENSITIVE" TURKEYS have the frozen food industry worried.

Even when the temperature is held at below freezing, 20 to 25 degrees Fahrenheit, a frozen bird will very likely darken. Frozen poultry, the U. S. Department of Agriculture has reported, loses flavor and attractiveness with increasing speed as storage temperatures rise. Turkeys generally are more sensitive to temperature than are chickens.

Both cut-up and pre-cooked poultry are less stable than whole, uncooked poultry when it comes to undesirable changes. However, at 10 degrees Fahrenheit and lower, chicken a-la-king will keep its meat flavor for as long as a year. To complicate the problem, fried chicken will "turn" twice as quickly at these temperatures.

Chlorophyll, research with green beans showed, is lost at the rate of about 10% annually at zero degrees Fahrenheit. At 30 degrees Fahrenheit, still below freezing, this loss occurs about 50 times as fast as at zero. This green color in frozen snap beans is lost about twice as fast as in frozen peas.

Frozen foods, USDA scientists pointed out, decline from top quality as a result of several kinds of change, all of which move increasingly faster as temperature rises.

The USDA's western utilization research and development division at Albany and Pasadena, Calif., is currently trying to find out why these changes take place and what can be done about giving the consumer the best quality for his dollar. "Time-temperature-tolerance" studies are providing some much-needed answers.

Science News Letter, June 14, 1958

Questions

ANTHROPOLOGY—How do the inhabitants of various villages in the Philippines determine when to start their sowing? p. 372.

ASTRONOMY—What are the dimensions of a second-order cluster? p. 371.

PHYSIOLOGY—What is the scientific name for "runaway heart"? p. 374.

Photographs: Cover, Harvard University; p. 371, U. S. Army; p. 373, U. S. Department of Agriculture; p. 374, Daystrom Incorporated; p. 375, J. W. Fecker, Inc. (American Optical Company subsidiary); p. 378, Lockheed Aircraft Corporation; p. 384, J. B. Sebrell Corp.

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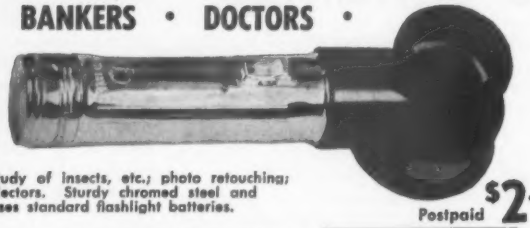

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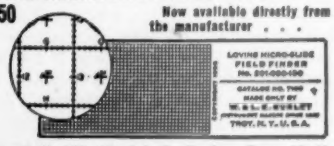

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PLANT PATHOLOGY

Old Method of Relating Plant Viruses Refuted

➤ INFECT A PLANT with one virus and then inoculate it with another virus, and cross protection or interference may result. The first virus may protect the plant against the effects of the second—it interferes with its action.

When no evidence of disease appears in the plant, scientists had believed this was evidence for saying that plant viruses were closely related.

Now, however, according to experiments made by a British scientist, there is evidence that viruses appearing "quite distinct" interfere with one another's infective potential.

Using related and unrelated viruses, A. D. Thomson of the Virus Research Unit, University of Cambridge's Molteno Institute, found interference occurred within both groups.

For example, he reports, prior infection with tobacco mosaic virus reduced to at least 50% the number of lesions appearing on a plant inoculated with the unrelated virus, cabbage black ringspot.

Details of the experiments, in which tobacco plants were used, appear in *Nature* (May 31).

Science News Letter, June 14, 1958

METEOROLOGY

Find Early Temperature Records in North America

➤ THE EARLIEST KNOWN temperature readings in North America were taken in 1731 and 1732 at Germantown, Pa.

Even before that, however, a set of precipitation totals near Harvard College for 1715 and a set of barometric pressure readings for Boston in 1725 and 1726 have now been found.

The only other known weather record of earlier date is a non-instrumental abstract of one year of a two-year record kept near the present-day site of Wilmington, Del., in 1644.

Thus the 1737 observations of Dr. John Lining at Charleston, S. C., long believed to be the first instrumental weather records in Colonial America, no longer hold the title.

The earliest known instrumental information from North America was collected by Thomas Robie, who graduated from Harvard in 1708. He recorded precipitation totals at Harvard in 1715.

The second instrumental record of the three now known to precede that of Mr. Lining's is Mr. Feveryear's observations on barometric pressure in Boston in 1725 and 1726. He also observed wind direction and made general comments on the weather.

The non-instrumental abstract of weather conditions near Wilmington was made by the Rev. Johan Campanius.

The search for old records for North America was made by Lt. j.g. James M. Havens, now on duty at the U. S. Fleet Weather Facility, London. His report appears in the *Bulletin of the American Meteorological Society* (April).

Science News Letter, June 14, 1958

Kodak reports on:

nobility from Stuttgart . . . cheating one's biographer of a little color . . . the answers an infrared photoresistor buyer is expected to know

If only you needed a camera

From our Stuttgart factory we are now importing these *Kodak Retina Reflex Cameras*. They sell for $215 with the basic 50mm *f*/2 *Retina Xenon-C* 6-element coated lens. Interchangeable 6-element components are available to provide a focal length of 35mm for wide angle or 80mm for telephoto work. There must be a good reason why noble optical equipment should be named after a noble gas. German engineers never do anything illogical.

With *f*/2 and the remarkable film sensitivity now obtainable, surprisingly many pictures will be made with no auxiliary light at all. For the rest, the camera provides synchronization with all popular flashbulbs and discharge lamps at speeds up to 1/500 second.

For a happy-moments camera employed occasionally in a bat cave the coupled split-image rangefinder of the *Retina Reflex* would suffice. This camera extends itself beyond aim-and-fire applications. For technical work, as in photomicrography with the *Kodak Retina Microscope Adapter Kit, Type C*, the other and larger aspect of its character comes into play.

The rangefinder split-field is but the center of a truthful preview of the entire picture, seen upright and laterally correct. This image is formed at full lens aperture by the taking lens itself, so that even at only six inches film-to-subject distance (as with one of the *Kodak Retina Close-Up Lens Sets* instead of a microscope) the boundaries of the 24mm by 36mm picture inevitably coincide exactly on the ground glass as on the film. Since the entire picture may be examined on its extrafine surface, the focusing may be adjusted to favor any portion thereof without re-aiming—a simple point worth remembering when comparing cameras of this type.

Phone a camera shop and check whether they have yet received a Kodak Retina Reflex Camera *you can examine. If we had known you were interested, we would have left room here for details on the built-in photoelectric exposure meter, the mechanical linkage of shutter speed to diaphragm setting, and the way the instant before exposure it stops down to the aperture chosen.*

Glucosamine

Because of an item we read in the *Wall Street Journal* recently, a copy or abstract of which we refuse to supply, we predict that this year will see an upsurge of interest in the biochemistry of glucosamine.

This amino sugar is easy to prepare. The classical starting material is chitin, and the essence of the method is acid hydrolysis. Chitin can be obtained in several ways. Perhaps the most efficient of these is to go around to the back door of the most prosperous sea food restaurant within easy reach and talk to the official in charge of the garbage cans about a deal for his vacant lobster shells. A slower method is to put shrimp on the family menu as often as necessary and save the peelings. Investigators with a distaste for sea food can get their chitin at this season of the year by putting a corps of small boys to work hunting June bugs.

For those who shun behavior tending to mark them as colorful scientific personalities, there is still another alternative. They can purchase ready-purified D-*Glucosamine Hydrochloride* as Eastman 644. Foreseeing the demand from the shy ones, we have laid in a stock of clean chitin that looks like breakfast food or perhaps fingernail clippings.

Each one of the 3600 or so Eastman Organic Chemicals available from Distillation Products Industries, Rochester 3, N. Y. (Division of Eastman Kodak Company) has its own story.

Lead selenide in the open

Lead selenide photoresistors can now be discussed without checking clearance at the door.

The purchase order will read *Kodak Ektron Detector* (*Lead Selenide*), *Type R2*. The exact size of sensitive area (minimum dimension, 0.25mm) and its configuration (anything from a square to as intricate a multiple array as you can afford) will have been worked out in correspondence with Eastman Kodak Company, Military and Special Products Division, Rochester 4, N. Y. This is the freedom you get with a chemically deposited photoresistor.

Lead selenide, *Type R*, responds well out to 4.5μ at room temperature, with a time constant less than 10 microseconds.* Cooled with dry ice, it goes out to 5μ, but the time constant doubles or triples.

Of course, you don't want lead selenide at all unless you need the long wavelength response and the short time constant. To a 500°K source, for example, chopped at 90 cycles, you can get 35 times more response with lead sulfide, as in the *Kodak Ektron Detector, Type N*. Its time constant, though, is characteristically in the range of 500 to 1000 microseconds.

We have two other kinds of lead sulfide depositions besides *Type N*. In respect to 500°K, 90-cycle radiation, they lie between *Type N* and *Type R*. There is *Type O*, with around half the time constant of *Type N* and two-thirds its response. The other one is *Type P*, with a time constant near 100 microseconds and a 500°K response about one-quarter that of *Type N*. You can get beyond 3μ with it at room temperature, and beyond 4μ by cooling it. That was the best we could do for you on long wavelength response till they let us start selling lead selenide.

In the infrared business one doesn't dare quit racing one's engine.

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*For the instruction of the young, that's how long it takes response to drop off to 1/e what it was before the radiation was turned off. e is the base of natural logarithms and is worth around 2.72.

Price stated includes Federal Tax and is subject to change without notice.

This is another advertisement where Eastman Kodak Company probes at random for mutual interests and occasionally a little revenue from those whose work has something to do with science

Kodak

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For sources of more information on new things described, send a self-addressed stamped envelope to SCIENCE NEWS LETTER, 1719 N St., N.W., Washington 6, D. C., and ask for Gadget Bulletin 939. To receive this Gadget Bulletin without special request each week, remit $1.50 for one year's subscription.

TRANSISTORIZED RADIO RECEIVER is smaller in size than a king size package of cigarettes. The receiver, including batteries, weighs five ounces. It is said to have full broadcast band coverage from 550 to 1,600 kilocycles.

Science News Letter, June 14, 1958

CIRCUIT TESTER can be used for both continuity and line testing in electrical wiring. The probes and cords are carried on a frame that fits into a coat pocket. The probe sleeves are made of a butyrate plastic. For continuity testing, it plugs into any 110-volt receptacle. For line testing, the probe cords plug into the insulated frame.

Science News Letter, June 14, 1958

PORTABLE TAPE-RECORDER is a British product designed for home, office, factory, school and shop. It has a frequency response of from 40 to 14,000 cycles per second. The machine, which can be used with a loudspeaker, allows a recording to be made over a previous one without obliteration.

Science News Letter, June 14, 1958

ALUMINUM BUILDING UNITS, shown in the photograph, can be assembled as carports, tool sheds or outdoor dressing

rooms. Shipped according to specified length, width and height, the units arrive ready for bolting together. All the necessary bolts and screws are included. The units can be disassembled for storage.

Science News Letter, June 14, 1958

RADIATION DETECTOR is a small, lightweight aluminum cylinder that tells at a glance the amount of radioactivity exposure from gamma or X-rays. The detector, which can be carried in a pocket or a purse, has a range of 200 milliroentgens.

Science News Letter, June 14, 1958

INFLATABLE MATTRESS for this summer's camping is made of heavy canvas fabric. It is said to have three and one-half inch minimum air cushions at all points. There are no longitudinal tubes. The mattress can be blown up by mouth or pump.

Science News Letter, June 14, 1958

CAMPING OUTFIT, designed to be carried on top of the car, provides three-quarter size beds, a tent with 107 square feet of floor space and an aluminum frame that eliminates stakes and ropes. The outfit weighs 35 pounds and can be set up by two persons in 10 minutes.

Science News Letter, June 14, 1958

DUST PAN made of a high density polyethylene plastic is designed for "no stoop" sweeping. Seven horizontal grooves catch the dirt and trap sweepings. The pan is 11 and one-half inches wide and 15 inches high. It can be boiled clean.

Science News Letter, June 14, 1958

Nature Ramblings

By HORACE LOFTIN

Summer's Start

➤ DURING THE past winter, one city dweller used to gaze out of his second story office window into the naked branches of a maple. The stark finger-like twigs seemed as dead as the air was frigid. Then winter waned and spring became imminent.

The tree remained bare, but he seemed to note a swelling in the tree buds, as if the tree were straining to expand itself.

It was in May when the view from the window suddenly disclosed—overnight, it seemed—a tree that was a reddish color. The tree blossomed with tiny flowers. Thereafter, leaves grew larger and larger, acquiring their familiar green coloring, until the whole tree took on its June-time appearance.

Now, on the branches of this same tree, so bare a short while ago, there is a new nest being built by a busy pair of birds. It is the final sign that June has come.

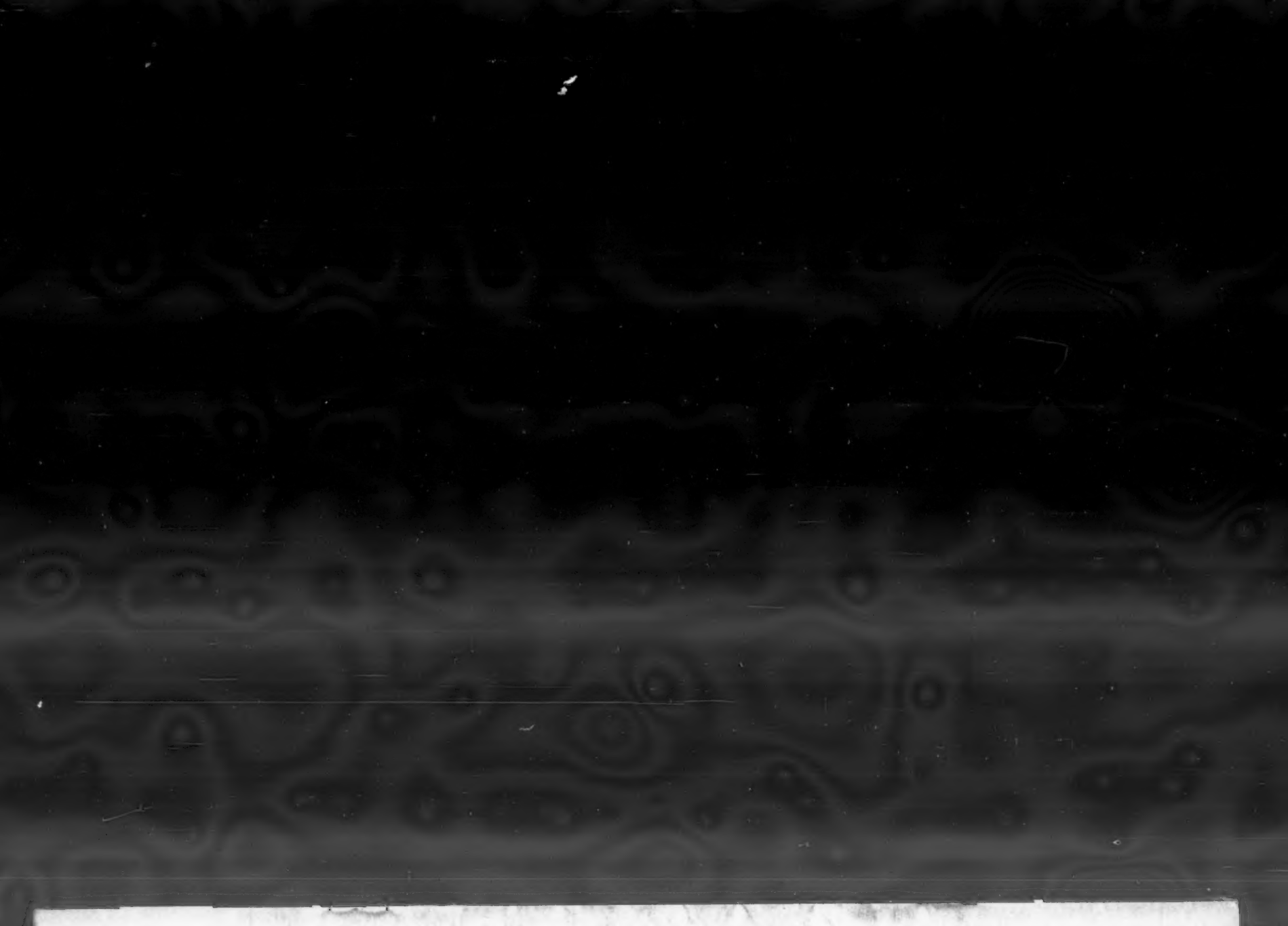
While some "early birds," especially in the South, may begin nesting somewhat earlier in the year, June is the big month for birds. Winter flocks have broken up into discrete couples who jealously guard their nesting territory from others of their kind.

The migrant warblers have come up from Central and South America to their old homes in the United States and Canada. Even the shore birds that winter as far away as Patagonia and Tierra del Fuego have passed over the United States to begin their June nesting above the Arctic Circle.

In much of the nation, the spring flowers have come and gone, to be replaced by the first of the summer-blooming plants. Only where spring is late and brief, as in the northern and mountainous areas, does June find many of the typical springtime blossoms.

With June also comes the beginning of a new crop of insects, to create a good deal of mischief and to do perhaps even a greater deal of good.

Winged termites may be seen swarming out of bits of riddled wood, and hungry young generations of beetles and insects emerge from their pupal cases to launch an attack on cultivated plants. At the same time, other insects flit busily from flower to flower, transferring the vital pollen from one plant to another.

Other insects begin to feed hungrily on insect pests. June, it seems, is busting out all over.

Science News Letter, June 14, 1958